DOCUMENT RESUME

ED 243 518 JC 840 191

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TITLE New Technologies in the Service of the Learner: An Imperative.
PUB DATE 12 Oct 83
NOTE 16p.; Paper presented at the National Conference of the League for Innovation in the Community College (Newport Beach, CA, October 10-12, 1983).
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Change Strategies; Community Colleges; *Computer Assisted Instruction; Computer Oriented Programs; *Educational Change; *Educational Technology; Educational Trends; *Instructional Innovation; *Technological Advancement; Two Year Colleges

ABSTRACT

The increased use of educational technology represents an attitudinal, as well as a technological, change in instruction. Educational technology affects instruction in that it allows the student to accept more of the responsibility and effort connected with learning; provides for new criteria for grading by competencies in specific areas; widens educational access for those who cannot attend a college campus; provides opportunities for expanding automatic reinforcement and promoting mastery learning; and frees the instructor from the presentation of rote material and thus permits more time for interpretation, analysis, and creative discussion. Experts are predicting even more dramatic uses of computers in the future, foreseeing greater interactivity, portability, multi-media capabilities, power, diversity, and availability. These advances not only represent technological improvements, but have broad philosophical implications, such as changes in the definition of intelligence, social views of education, and public and student attitudes toward educational productivity. In order to bring community colleges to the fullest use of computers, community college leaders must: (1) recognize that many faculty members are antagonized by the technological jargon and confused by the gadgetry, and, therefore, must be provided with an environment in which to overcome this hesitancy; (2) take an active role in seeing that the courseware that reaches the classroom is practical and worthwhile; and (3) initiate efforts to meet the high costs of acquiring and maintaining state-of-the-art computer systems. (LAL)

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"New Technologies in the Service of the Learner: An Imperative"

by

Leslie Koltai

Presented to the League for Innovation
Newport Beach, California

October 12, 1983

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Futurist Marshall McLuhan once observed that "Any new technology gradually creates a totally new human environment."

He wasn't speaking specifically about computers and other forms of information-processing technology, but his observation suits them perfectly. Computers, videodiscs, videotexts, word processors, satellite communications systems, even cable and traditional television sets have changed the way America works, shops, and relaxes. And now they are changing the way America learns.

I doubt that there are many educational administrators these days who are unfamiliar with the terms floppy discs, "K's," disc drives, and bits, to mention just a few. Information resource technology has found wide application in such areas of our operation as administrative record keeping, teleconferencing, student record filing and retrieval, automated payroll and registration systems, library indexes, and monitoring of heating and cooling systems. We use technology to provide students with job market information, articulation agreements, and to guide them toward fulfillment of often-complicated graduation requirements. When properly programmed and used, technology can also quickly and efficiently provide the information necessary for important institutional planning decisions, involving such aspects as class scheduling, curriculum development, and cost-efficiency determinations.

In my remarks today, however, I would like to focus on the instructional use of educational technology, which is generally seen as a reinforcement for traditional forms of instruction.

And whatever its application, we're finding that educational technology is more affordable and more available than ever before. And we're also finding that it represents an attitudinal, as well as a technological, change in instruction.

For one thing, educational technology allows the student to accept more of the responsibilty and effort connected with instruction. Students can move through the curriculum at their own pace, thus eliminating the need for many of the traditional time configurations associated with schooling. And, since students can work alone on the equipment, no instructor is needed for many assignments and learning can take place around the clock.

Also, computer and other instruments of educational technology can give us new criteria for grading by competencies in specific subject matter.

Technology has also been effective at bringing education to those who cannot attend college, such as the handicapped and the elderly, as well as making it more effective for those with learning disabilities.

Educational technology in general, and computers in particular, enhance the delivery of instruction that is expert-directed, sequenced, and structured.[1]

It can diagnose and prescribe; it can remediate or accellerate. It can praise, cajole, admonish and reward, depending upon how it is programmed. It can be dynamic, presenting students with graphic visual aids. And it can be responsive, adapting to the learner's performance and directing subsequent activity. It presents great opportunities for pedagogical diversity, and is beneficial in improving perception, retention, comprehension, and problem-solving skills.

In fact, behavioral psychologist B.F. Skinner recently observed that educational technology presents exactly the kind of automatic reinforcement for learning he says is so necessary.[2]

Technology is also worthwhile in promoting mastery learning which, as Harvard Lecturer Patricia Cross explains, "Permits all students to learn to the same high degree of achievement, regardless of time period."[3]

And, when used appropriately, educational technology can free the instructor from presentation of rote material and thus permit more time for interpretation, analysis and creative discussion.

The experts are predicting even more dramatic uses of these wonder machines. They tell us that the computer will be used more extensively in testing, and that we'll be seeing the convenient use of local microcomputers for the scholastic aptitude test and other such examinations. We're also told that tests will become more interactive, with questions steadily increasing in difficulty until the student begins to give incorrect answers.[4]

And we'll be seeing more convenient computing with the advent of the first "true portable"--microcomputers that work anywhere for many hours on lightweight small internal batteries.[5]

And experts tell us the next step in educational technology will be the development of the "intelligent videodisc" which will combine the capbilities of the stand-alone computer and the new optical videodisc systems. In other words, multi-media experiences such as films, slides and sound will be combined with a wide range of computer-aided materials for an incredibly effective educational delivery system.[6]

But the potential for creative and innovative uses of educational technology is just beginning to be tapped. For example, Donald Blitzer of the PLATO project at the University of Illinois suggests covering the entire country with a million-terminal educational computer system, to be based on three communication satellites. And there are those who predict--or should I say "warn"--of paperless classrooms and bookless libraries.

Also, while much of the current use of computers in instruction has involved timesharing systems, with central machines providing services simul-

taneously to many different users, we're told that the personal computer will be the focus of future educational activities, with usage by a single person or a small group.[7.]

There will continue to be rapid advancement in this field, since the tools of educational technology are constantly becoming more powerful, more diversified, more available--and less expensive. For example, computer costs are expected to decline by a factor of ten over the next five to seven years.[8]

Automated instructional strategies are not only a technological advance, but they are also a social phenomenon, with broad implications of a philosophical nature.

For example, when we talk about "what we know," we no longer refer to the information that is stored in our minds. Today, we mean that which we are able to access, as well.[9]

And even the definition of intelligence will be changing, according to some experts, who point out that memory--generally considered to be an essential element of one's intelligence--will no longer be as important, since machines will take over the function of storing vast quantities of information. Other capabilities, such as problem solving, will than take on greater significance.[10]

Technology also has implications in terms of the way in which society views education. For example, the World Futures Society Bulletin points out that, in the last 100 years, in developed countries, our travel speed has increased by a factor of 100; our control over infectious disease, by a factor of 100; our energy resources, by a factor of 1,000; our data-handling capabilities by a factor of 10,000; and our weaponry power by a factor of

one million. Our communications ability and speed have increased by a factor of 10 million. But, because education is so highly labor-intensive, we cannot demonstrate such increases. And society is impatient with what it perceives as lack of increased productivity. More and more, educators are realizing that taxpayers want educational institutions to lower the cost of instruction while improving its quality. And they're realizing that technology can assist in both areas.[11]

Our students, too, are favorably impressed with educational technology. William Bergquist's book, Designing Undergraduate Education, makes the point that students appreciate the computer's ability to forget their past failures while rewarding their current successes. And, since there is a certain mystique surrounding much of this new technology, students feel there is no stigma attached to getting extra assistance from the computer.[12]

In short, a solid technological education support system is needed to present a learning environment that is efficient, effective, and able to respond to widely diverse student needs.

But, just as it has taken tremendous adjustments for business and industry to smoothly integrate the new technologies into everyday operations, so will it take time and effort to maximize education's utilization of these tools of learning.

And we must remember that there is a tremendous difference between having the new technology and fully implementing and utilizing that equipment.

Management Focus Magazine points out that it takes more than the appropriate equipment to implement a technologically sound education support system. It also takes the right environment, the right personnel, and the right procedures.[13]

Merely having computers and other educational technology available is no guarantee that they will be used in creative and constructive ways. As with most changes, administration has a key role in how well or how poorly a college adapts to the influx of educational technology.

For, in order to bring our institutions to the fullest use of these wonder machines, we must first recognize that there are many on our campuses who are antagonized by the jargon and confounded by the gadgetry. They find the technology threatening and bewildering. They are intimidated and even hostile.

Gordon Bowden, a consultant for Executive Development and Education, observes that this is nothing new, adding that there have always been those who "Have resisted the use of technology in the classroom, ever since the advent of motion pictures."[14]

And other observers remind us that there were those who resisted the changes brought about by the invention of movable type.

Right now, in our classrooms, we have faculty members who aren't even comfortable using overhead projectors. How can we expect them to be anything but resistent to discussions of computers, videodiscs, cathode ray displays, and so on?

It is going to take a major effort to help the techno-phobics adjust to the world of today--and tomorrow.

Of course, there are those who express concern that the computer will promote rigidity by standardizing and formalizing the instructional methodology. There are those who fear that machines will replace people and result in massive teacher cuts.

We, then, need to demonstrate that technology can result in more effective use of teacher time, freeing instructors from much of the drudgery and permitting

greater professional creativity and satisfaction. We need to emphasize that while jobs will probably not be reduced, they will be altered as a new partner is added to the educational process.

We can't blame our faculty, staff and administrators for being intimidated by the new technology, but we can blame ourselves if we don't provide the environment and create the atmosphere for them to overcome this hesitancy. We must realize that we will never reach the true potential of educational technology unless we devote a great deal of attention to the training, and periodic re-training, of our personnel, for it will be these individuals who will play a major role in deciding whether the new machines become tools of confinement or keys to unlock hidden doors.

We need to demonstrate that educational technology is our servant, not our master; that it can help us to expand our own capacities and overcome or compensate for our very human limitations.

And we must commit ourselves to maintaining a learning and teaching environment that is human as well as technologically sound, which is not always an easy balance to maintain.

Dr. Christian Jernstedt, Professor of Psychology at Dartmouth College, says that technologists have traditionally overlooked the personal elements of learning, while the humanists have seen technology as an intruder in their classrooms. He advocates the creation of a synergic combination of machines and people in a truly collaborative process achieved through better training, retraining, and communication.[15]

A recent issue of T.H.E. Journal points out that there are two intelligent resources actively involved in the teaching of students--machines and people. One need not replace the other but, together, they can work in tandem to produce effective learning experiences for a wide variety of students in an unprecedented variety of situations.

The Journal observes that the situation has created a sort of tension between what it calls the "technologists" versus the "humanists," with the former placing emphasis on the practical, the logical, the scientific, and the latter stressing the importance of human values, interest, and self-realizaton.[16]

We can help to minimize this tension by pointing out that educational technology can make the process of instruction more personal, more individual, more responsive--if it is used correctly.

And we must not forget that technology does not present the only way to deliver instruction, just as lectures or laboratory work don't provide the answer to every classroom challenge. We must not forget that educational considerations must always take precedence over technological considerations.

William Wallisch, an American Council on Education fellow studying the impact of educational technology, puts it in the right perspective when he says that faculty members are the software of the new age of learning. They are the "input the machines must have in order to have a useful message." Instead of fearing or rejecting these teaching tools, we must help our faculty learn to control the machines.[17]

And we must demonstrate that technology does not remove faculty options--it increases them. As the manager of learning, the instructor determines what materials are used in the classroom. As it is pointed out in the book, Using Instructional Technology, there is a careful and essential distinction between the content of the material presented and the design of the delivery system. Because the computer assists with the delivery of information, it needn't be assumed that it limits the content of that which is presented.

In other words, "The content is the province and responsibility of the subject-matter specialist--the faculty who are professionally prepared

and professionally responsible for the content of the discipline." echnology merely presents several more appropriate vehicles for the delivery of that content.[18]

Alfred Bork's exellent book, Learning With Computers, emphasizes the exciting opportunities for professional growth presented by the new technologies, adding that the instructors can become the designers and developers of coursework, instead of serving only as the deliverers.

In fact, instead of fewer jobs for instructors, it is reasonable to assume that there will be more jobs, with some outside the classroom--in the development of software, in industry, or in the media.

After all, learning depends--not just on the transmittal of information--but also on many social and interpersonal factors. The computer doesn't establish eye contact. And it falls short in what could be called "the semantic context of learning," the presentation of subtleties far beneath the systematic presentation of facts that is so necessary to give color and complexity to information.

It is vital, too, to create the proper physical environment for the tools of technology. Management Focus Magazine emphasizes that many institutions fail to recognize the difference between automated and non-automated environments. There are pitfalls to this kind of approach, since poor location planning can contribute to excessive equipment failure while mitigating any expected benefits. Room temperatures, accessibility and traffic patterns must all be considered in the placement of computers and other educational machines.

Also necessary is effective courseware which is comprehensive, sequenced and criterion-referenced. But, unfortunately, the development of appropriate educational software is still somewhat of a cottage industry.

Christopher Dede of the University of Houston's Future Studies Department points out that, while all the educational technology we need to change the teaching/learning model already exists, the software does not.[19]

According to the Educational Products Information Exchange, "there are now 620 manufacturers of computer courseware in this country, and they have produced more than 2,500 educational software products." But most of that effort has gone into developing packages for elementary and secondary schools. College-level courseware is more likely to be developed by individual institutions or through consortia.[20]

The lack of software was one of the primary topics on the agenda of a recent meeting of experts in the field of educational technology which was held by the Modern Language Association and the National Endowment for the Humanities. At that meeting, it was reported that there is an urgent need for more courseware designed for use in the humanities instruction--and better quality in that which is produced. The experts said, "Scholars should take an active role in seeing that the courseware that ultimately does reach their classes is both practical and worthwhile," adding that, often, it is neither.[21]

A number of institutions are working to remedy this situation. Miami-Dade Community College, for example, has developed a very effective program of teaching writing with the computer. And members of the Sunbelt Consortium have been working together to develop ways in which to cooperate on the development of appropriate software.

Of course, in any field with as many rapid changes as there are in educational technology, there must be frequent reviews of existing systems in order to refine and enhance them as the technology evolves.

That is an expensive proposition, however, and many institutions are concerned about how much of their budget to devote to machines instead of to people. For, even though it is much more cost-effective than ever before, technology still represents a tremendous potential expenditure for colleges and universities. And experts tell us we need to spend much more than we currently are allocating.

Robert Gillespie, Vice Provost for Computing at the University of Washington, did a study on computers in higher education for the National Science Foundation and recently presented his findings before the Science and Technology Committee of the House of Representatives.

He reported that colleges and universities now spend about $3 million a year for the use of instructional computers. But he said that, in order to meet student access needs, about $1 billion a year should be spent.

He advocates spending about $100 per student on computing, which is about what is spent on libraries nationwide.[22]

And Richard Van Horn, Provost of Carnegie-Mellon University, predicts that, by the end of this decade, a "reasonable" computer system will cost about $1,000 per student at a liberal arts college, and up to $6,000 per student at a high technology school.[23]

According to Gillespie, the average undergraduate student needs at least 20 to 40 hours of computer access per year. But present computer resources permit an average of about 10 hours of access.[24]

As you are aware, some colleges and universities are moving toward requiring students to purchase their own personal computers. And some institutions are beginning to provide computer terminals for members of their faculty

to use at home. These steps might be more than public community colleges are willing to do, but we can do our best to ensure that students and faculty are given every available opportunity to become computer literate.

Ladies and gentlemen, our colleges are obligated to move with the technological revolution. More and more, business and industry will be looking for computer-competent employees, whether in publishing, manufacturing or service industries. If we fail to provide our students with the expertise they need in this important area, we will have done less than we should in terms of preparing them to compete successfully in the marketplace.

And more and more four-year institutions will be expecting transfer students to be on a par with their native students in terms of computer competency. This is another important area for which we cannot neglect to adequately prepare our students.

Due to the high costs of acquiring and maintaining state of the art systems, coupled with the decline in real revenues, we're in a definite financial bind. I submit to you that what is needed is a federal program of matching grants to encourage colleges to commit the funds necessary to adequate access to computers. Coupled with such a program should be a system of incentives for industry to provide or lend equipment to educational institutions, as well as to provide trianing on its use.

As one expert in the field put it, the use of educational technology on our campuses can be as simple or as complicated as we want it to be.

I suggest that it can also be as effective or as ineffective as we enable it to be. The choice is up to us.

Footnotes

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